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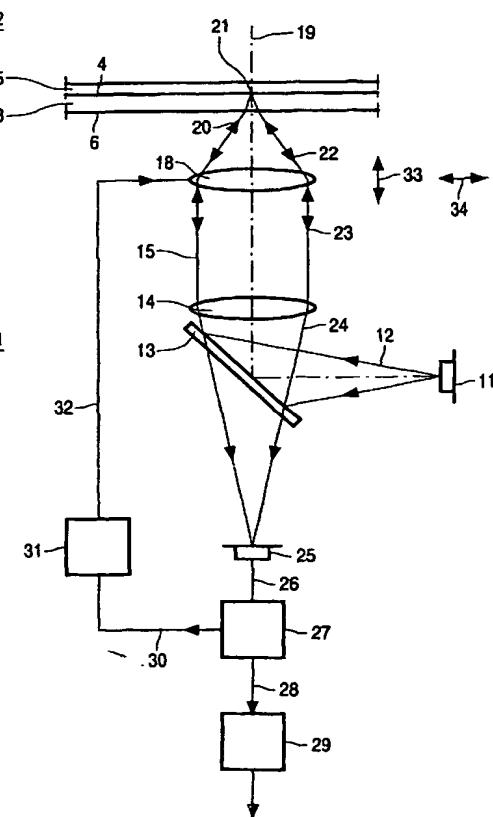
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[Continued on next page]

(54) Title: OPTICAL SCANNING DEVICE INCLUDING A TILT TOLERANT OBJECTIVE SYSTEM



(57) Abstract: An optical scanning device (1) for scanning an information layer (4) of an optical record carrier (2), the device including a radiation source (11) for generating a radiation beam (12) and an objective system (18) for converging the radiation beam (12) on the information layer, the objective system (18) being characterized in that the ratio of the root mean square of the optical path difference's (OPD's) generated by the objective system at oblique beam entrance to the system satisfies the condition of formula (I) within the field of the objective system, where OPD(A31) is the contribution of the third order Zernike coma to the root mean square wavefront aberration and OPD(A51) is the contribution of the fifth order Zernike coma to the root mean square wavefront aberration.



European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR,*

TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

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INTERNATIONAL SEARCH REPORT

Internal Application No
PCT/IB 03/02422

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G11B7/135 G02B13/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G11B G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 01 48744 A (WALS JEROEN ;VREHEN JORIS J (NL); KONINKL PHILIPS ELECTRONICS NV () 5 July 2001 (2001-07-05) abstract page 1, line 20 -page 2, line 23 page 5, line 1 -page 8, line 29; figures 1,4A ---	1-4,10, 11
A	US 5 726 436 A (EGUCHI NAOYA ET AL) 10 March 1998 (1998-03-10) the whole document ---	1-4,10, 11
A	WO 02 29797 A (KONINKL PHILIPS ELECTRONICS NV) 11 April 2002 (2002-04-11) abstract page 3, line 26 -page 4, line 29; figure 1 page 8, line 6 -page 12, line 9 ---	1-4,10, 11
	-/-	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
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- *O* document referring to an oral disclosure, use, exhibition or other means
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T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

8 document member of the same patent family

Date of the actual completion of the International search

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16/10/2003

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 762 155 A (MATSUSHITA ELECTRIC IND CO LTD) 12 March 1997 (1997-03-12) page 2, line 23 -page 3, line 46 ---	1-4,10, 11
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 26, 1 July 2002 (2002-07-01) & JP 2001 249272 A (KONICA CORP), 14 September 2001 (2001-09-14) abstract -----	1-4,10, 11

INTERNATIONAL SEARCH REPORT
Information on patent family members

Internat'l Application No

PCT/IB 03/02422

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
WO 0148744	A	05-07-2001	WO EP JP US	0148744 A1 1163670 A1 2003518702 T 2002175266 A1		05-07-2001 19-12-2001 10-06-2003 28-11-2002
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WO 0229797	A	11-04-2002	CN WO EP US	1398399 T 0229797 A1 1327246 A1 2002105733 A1		19-02-2003 11-04-2002 16-07-2003 08-08-2002
EP 0762155	A	12-03-1997	DE DE EP JP JP US	69625862 D1 69625862 T2 0762155 A1 2922851 B2 9120027 A 5986779 A		27-02-2003 18-06-2003 12-03-1997 26-07-1999 06-05-1997 16-11-1999
JP 2001249272	A	14-09-2001	NONE			

INTERNATIONAL SEARCH REPORT

Int'nal application No.
PCT/IB 03/02422

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: 5 – 9 because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.
 No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 5 - 9

Present claims 5 - 9 relate to an extremely large number of possible apparatus/methods. Support within the meaning of Article 6 PCT and disclosure within the meaning of Article 5 PCT is to be found, however, for only a very small proportion of the apparatus/methods claimed. In the present case, the claims so lack support, and the application so lacks disclosure, that a meaningful search over the whole of the claimed scope is impossible.

The description consistently refers only to the miniature objective lens system for an optical scanning device for scanning an information layer of an optical record carrier. All examples for embodiments of the invention given in the description show objective lenses for optical information reproducing/recording devices. Also, the technical problem described is entirely based on the optical setup of an optical scanning device for optical discs. Moreover, the examples given in the description show only objective lenses for optical disc pickups with one or two lens elements whereas in claims 5 - 9 a lens system with at least one lens is claimed; it is however not possible for a person skilled in the art to extrapolate the teaching of the description to a complex lens system with a multitude of lenses.

In summary it is neither generally possible to transfer the teaching of the description to any kind of lens system with any size and for any application, nor are there indications given in the description how a person skilled in the art could transfer the teaching of the description to lenses in other fields of application without the use of inventive skill.

Consequently, the search has been carried out for those parts of the claims which appear to be supported and disclosed, namely those parts relating to the apparatus/methods of claims 1 - 4 and 10 - 11.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an International preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.